LABORATORY CHEMICAL AND WASTE MANAGEMENT

The National Park Service (NPS) operates laboratories associated with water and wastewater quality monitoring, environmental research, photo processing, and environmental education (teaching). This EnviroCheck Sheet applies to all laboratories where hazardous chemical use occurs.

Laboratories are unique in that they may:

- Contain a small quantity of a large variety of chemicals. For example, it would not be unusual for a lab to have more than a dozen chemicals in routine use and many more for occasional use. Chemicals may include gases, liquids, and solids. Examples are compressed gas bottles and cylinders (e.g., oxygen); reagent bottles (e.g., nitric acid); organic solvents (e.g., alcohol); and powders, tablets, or crystals (e.g., metal salts, solid caustics such as sodium hydroxide).
- Retain chemicals in storage for long periods of time. Examples are: (1) biological specimens preserved with alcohol or formaldehyde; or (2) chemicals that have a long shelf life such as acids.
- Create waste streams with unknown or uncharacterized hazardous properties when unique combinations of chemicals occur. This makes waste management especially challenging since it is vital to know what the waste is in order to properly handle it.

Auditor's Guidelines:

Records to Review
- Chemical Hygiene Plan or HAZCOM Plan
- NPDES permits
- NPDES permit renewal applications (if permit expires within 180 days)
- Material Safety Data Sheets
- Discharge monitoring reports for the past year

Features to Observe
- Floor and sink drains
- Chemical storage areas
- Laboratory ventilation hoods
- Wastewater plants
- Natural Resource Labs
- Drinking Water Labs

Persons to Contact
- Designated Chemical Hygiene Officer
- Lab technician
- Wastewater treatment plant operations
- Water treatment staff

DEFINITIONS

Chemical Hygiene Officer: An employee who is designated by the employer, and who is qualified by training or experience, to provide technical guidance in the development and implementation of the provisions of the Chemical Hygiene Plan.

Chemical Hygiene Plan: A written program developed and implemented by the employer, that sets forth procedures, equipment, personal protective equipment, and work practices that are capable of protecting employees from the health hazards presented by hazardous chemicals used in that particular workplace.
Hazardous Chemical: A chemical is hazardous for any of the following conditions:

- It is a combustible liquid, compressed gas, flammable substance, explosive, organic peroxide, oxidizer; is unstable or is water reactive;
- Acute or chronic health effects could occur to exposed individuals;
- It is a carcinogen or highly toxic; or
- The manner in which a chemical is manipulated presents an unusual or unique hazard that requires special protective measures.

Laboratory: A facility where the laboratory use of hazardous chemicals occurs.

Laboratory Scale Work: Work with substances in which the containers used for reactions, transfers, and other handling of substances, are designed to be easily and safety manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Laboratory Use of Hazardous Chemicals: The handling or use of chemicals in which all of the following conditions are met:

- Chemical manipulations are carried out on a "laboratory scale";
- Multiple chemical procedures or chemicals are used;
- The procedures involved are not part of a production process, nor in any way simulate a production process; and
- Protective laboratory practices and equipment are available and in common use to minimize the potential for employee exposure to hazardous chemicals.

LEGAL REQUIREMENTS

Federal

Although both laboratory chemicals (e.g., unused materials) and laboratory waste (e.g., used/expired chemicals) may occur in a laboratory, there is no single regulation covering all aspects of laboratory chemical and waste management. In fact, different regulations address each. Additionally, there is an Occupational Safety and Health Administration (OSHA) Lab Standard that addresses lab worker exposure to chemicals. Details on each of these topics follow:

Laboratory Chemical Management
Many, but not all, laboratory chemicals are hazardous. If a laboratory chemical is hazardous, it should be managed in accordance with applicable requirements such as those set forth in:

- 29 CFR 1019.106 (Flammable and combustible liquids)
- 29 CFR 1910.101 (Compressed gas cylinders)
- 49 CFR 171-179 (Transportation)

See the NPS EnviroCheck Sheet on Hazardous Materials Management for more details.

Laboratory Waste Management
Many, but not all, lab waste streams are hazardous. It is important to determine if lab waste is subject to the Resource Conservation and Recovery Act (RCRA). If laboratory waste is a RCRA hazardous waste, it must be managed as such. See the NPS EnviroCheck Sheet on Hazardous Waste Management and the NPS EnviroCheck Sheet regarding Paint and Solvents Management.

OSHA's Lab Standard [29 CFR 1900.1450]
OSHA's Lab Standard supersedes the Hazard Communication Standard [29 CFR 1910.1200] in research and teaching laboratories. Examples of research and teaching labs in the NPS are environmental testing or monitoring labs (e.g., water quality) or in education (e.g., parks as a classroom where biological specimens are collected, studied, and preserved). The Lab Standard also applies to labs, such as those associated with water and wastewater treatment works, which perform analyses simply to determine compliance with EPA discharge criteria. In addition, Natural Resource laboratories, even if the only process is fixing samples, are considered laboratories under the Lab Standard.

State and Local

It is vital to check with state and local regulations on lab-specific issues. State and local building codes specify requirements for flammable material storage that could affect ventilation systems and solvent storage in cabinets. Some, for example, adopt National Fire Protection Association (NFPA) Standard 45 on the storage of flammable materials in laboratories while others may rely upon a more general standard (NFPA 30) or a different code or standard. It is important to check with local authorities on code application.

Many states have unique perspectives on hazardous waste programs. For example, California has an active laboratory regulatory reform task group that is seeking simplification of RCRA as it applies to labs. At the local level, some municipalities may treat lab waste as a special category, especially regarding wastewater discharge.

COMPLIANCE REQUIREMENTS

The challenge facing labs is unique in that they often use a large variety of chemicals in only small quantities. A greater than average amount of knowledge is required to safely manage laboratory chemicals and waste because of the variety of chemicals encountered.

Labs adhering to the Lab Standard are expected to:

1. Have a Chemical Hygiene Plan (CHP) [29 CFR 1900.1450(e)(3)] containing the following elements and an indication of specific measures that will be taken to ensure laboratory employee protection:
   - Safety and health standard operating procedures;
   - Criteria to determine and implement control measures to reduce employee exposure to hazardous chemicals including the use of engineering controls, personal protective equipment and hygiene practices;
   - Methods to ensure fume hoods and other protective equipment are functioning properly;
   - Circumstances under which laboratory operations require prior approval from the employer;
   - Provisions for employee information and training;
   - Medical consultations and examination;
   - Designation of a Chemical Hygiene Officer;
   - Additional employee protection for work involving particularly hazardous substances (e.g., select carcinogens, reproductive toxins and highly toxic substances).
2. Evaluate and update the CHP at least annually [29 CFR 1910.1450(e)(4)].

3. Ensure that the CHP is capable of keeping occupational exposures below OSHA action levels or permissible exposure levels (PELs) [29 CFR 1910.1450(e)(1)(ii)].
4. Verify that initial employee exposure monitoring has been conducted for any substance which requires monitoring if there is reason to believe that exposure levels for that substance routinely exceed the OSHA action level for that substance, or if none, the PEL [29 CFR 1910.1450(d)(1) and (2)].
5. Have a training program that effectively addresses [29 CFR 1910.1450(f)(4)]:
   - Methods of observation used to detect the presence or release of a hazardous chemical;
   - Physical and health hazards of the chemical;
   - Employee protection measures;
   - Details of the CHP;
   - Signs and symptoms of hazardous chemical exposure;
   - PELs for hazardous chemicals;
   - Location and availability of the CHP and reference material.
6. Ensure labeling on incoming containers of hazardous chemicals are not removed or defaced [29 CFR 1910.1450 (h)(1)(i)].
7. MSDSs are maintained from incoming shipments of hazardous chemicals and are readily accessible to employees [29 CFR 1910.1450(h)(1)(ii)].

POLLUTION PREVENTION

Proven approaches to preventing pollution in labs include the following:

- Maintain a limited inventory of chemicals so that they do not expire/deteriorate, necessitating disposal;
- Do not mix hazardous waste with non-hazardous waste;
- Explore opportunities to substitute hazardous chemicals with less or non-hazardous chemicals;
- Replace regular lab apparatus with scaled-down experiments or procedures;
- Model chemical reactions with computer simulations rather than wet chemistry methods;
- Collect fewer or smaller samples;
- Reuse preservative solutions;
- Investigate silver recovery possibilities with photo waste streams; and
- Keep chemical containers closed when not in use.

FOR MORE INFORMATION

- NPS EnviroFacts Sheets on Hazard Communication, Hazardous Waste Determination, and Spent Solvent Management. Good NPS facility references.
- NPS EnviroCheck Sheets on Hazardous Waste Management, Hazardous Materials Management, Hazard Communication, and Paints and Solvents Management.
- EPA 233-B-98-001 "Environmental Management Guide for Small Laboratories," July, 1998. Call the EPA Small Business Ombudsman Clearinghouse at 1-800-368-5888 and ask for document EPA 233-B-98-001. Complete environmental regulatory and management approach with regulatory checklists and over fifty pollution prevention recommendations. Great bibliography for additional sources of information as well.
- EPA Web-based guide and/or training on Laboratory Waste Management. Contact Dr. Gerald W. Oakley at 202-260-1287.
- OSHA Lab Standard Interpretation and Compliance Letters, < www.osha-slc.gov/OshDoc/Interp_data/I19910208.html>

The following questions address selected regulations related to laboratory chemical and waste management. They are not intended to be a comprehensive audit of a park's operations related to the Occupational Safety and Health Standards applicable to laboratories. It is also not intended to be a comprehensive list of questions regarding the proper management of laboratory chemicals and waste, especially if that waste is hazardous. Instead, these questions are intended to focus additional attention on an area that can present complicated compliance issues for parks due to the number and variety of potentially hazardous chemicals present. For a comprehensive list of questions regarding hazardous materials and waste management, see the "Hazardous Waste Management" and "Hazardous Materials Management" EnviroCheck Sheets.

CHECKLIST ITEM	PRIORITY	NOTES
Handling		
1. If the park's lab staff use or store hazardous chemicals, procedures required in the Hazardous Materials Management EnviroCheck Sheet have been reviewed to determine potentially applicable requirements. [BMP]	3	
2. Lab staff conducts periodic chemical inventory audits or has other control measures so that chemicals are not kept beyond their safe and useful shelf life. [BMP]	3	
Waste Management		
3. If the park's lab generates hazardous waste, procedures required in the Hazardous Waste Management EnviroCheck Sheet have been reviewed to determine potentially applicable requirements. [BMP]	3	
4. Lab staff have a system for managing contaminated glassware and empty chemical containers that is environmentally sound and protects downstream waste handlers. [BMP]	3	
5. Lab staff have obtained guidance from the local solid waste authority about disposal of non-hazardous chemical solids in the normal trash. [BMP]	3	
Wastewater Management		
6. Lab staff have a policy on drain disposal of dilute solutions of chemicals that is consistent with and appropriate for the available wastewater treatment system (sanitary sewer or onsite septic system). [BMP]	3	
Chemical Hygiene Plan		
7. Non-production labs (e.g., wastewater or drinking water labs) have a comprehensive Chemical Hygiene Plan (CHP). [29 CFR 1910.1450(e)(1)]	2	
8. The laboratory has an assigned chemical hygiene officer. [29 CFR 1910.1450(e)(3)(vii)]	2	

CHECKLIST ITEM	PRIORITY	NOTES
9. The Chemical Hygiene Plan include each of the following elements and indicates specific measures that will be taken to ensure laboratory employee protection: • Standard operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals; and • Criteria that will be used to determine and implement control measures to reduce employee exposure to hazardous chemicals including engineering controls, the use of personal protective equipment and hygiene practices; particular attention is be given to the selection of control measures for chemicals that are known to be extremely hazardous. [29 CFR 1910.1450(e)(3)]	2	
10. The park has a complete comprehensive Chemical Hygiene Plan, including the following elements: • Annual evaluation and update; [29 CFR 1910.1450(e)(4)] • Effectiveness of CHP; [29 CFR 1910.1450(e)(4)] • Employee exposure monitoring; [29 CFR 1910.1450(d)(1) through (4)] • Training program; [29 CFR 1910.1450(f)(4)] • Adequate labeling; [29 CFR 1910.1450(h)(1)(i)] • Accessible and complete MSDS collection. [29 CFR 1910.1450(h)(1)(ii)]	2	
Spill Preparedness and Prevention		
11. Appropriate spill control supplies are available in clearly marked locations and in sufficient quantity for the types of spills that could occur. [BMP]	3	
12. Chemical and chemical waste containers, that are used or stored near sinks or drains, have secondary containment. [BMP]	3	
Pollution Prevention		
13. Priorities for a pollution prevention evaluation have been set for each material in the lab's chemical and waste stream inventory. Priorities are set by giving the highest rankings to the chemical and/or waste stream with the greatest toxicity or quantity. Lab staff also seek ways to eliminate the need for source chemicals using the recommended generic approaches in the section titled Pollution Prevention (see page 4 above). [BMP]	3	
14. The lab staff have evaluated the possibility of replacing mercury-containing devices (such as thermometers) with mercury-free devices. [BMP]	3	